* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] About the manufacture method of a steering rack shaft, especially this invention forms a rack gear tooth in the radii section, after carrying out bending of the work of the Sai chief tabular to U form, it fabricates this work tubular after that, and is made to be taken as a shell.
[0002]
[Description of the Prior Art] Recently, as much as possible lightweight-ization of autoparts is demanded for the purpose of the improvement in mpg of an automobile. As part of that, newly forming a rack gear tooth in the periphery side using a hollow pipe came (for example, refer to JP,4-173476,A, JP,4-173477,A, JP,6-182472,A, and JP,6-31350,A) to be performed from the rack shaft in a steering system also broaching the conventional solid rod, and forming a rack gear tooth.
[0003] Each manufacture method of these steering rack shafts is characterized by forming the rack gear tooth of predetermined length in the periphery side of a shell to shaft orientations. For this rack gear tooth, a pinion gears within a steering gearbox, and a gearbox is connected to a steering column through an intermediate shaft. Therefore, if rotation operation of the wheel of a steering is carried out, a pinion rotates within a steering gearbox, a rack will move, a steering rack shaft will be moved to one of right and left, a front wheel will be steered by this, and steering of an automobile will be attained.
[0004]
[Problem(s) to be Solved by the Invention] However, there are some problems in forming a rack gear tooth in the periphery side of a shell. That is, if it is going to carry out press forming by the dies body which has the rack tooth form for a rack gear tooth in the periphery side of a shell, there is a limit in the inner mold which must insert an inner mold into a shell and can be inserted into **** and a shell, and since it needs to be able to draw out after fabrication, there cannot be no inner mold effective besides inserting the solid round bar like the aforementioned conventional example. Therefore, in only forming a rack gear tooth in the thick section of a shell, since the thickness of the part in which the rack gear tooth was formed becomes thin, a strong fall is brought about. Therefore, when a thick big shell is used, as a result of being contradictory in lightweight-ization, a part of periphery section of the shell of necessary thickness is made to transform, and it thickens, and supposes that a rack gear tooth is formed in the thickening section, and for the reason, the number of processes increases and cost elevation is invited.
[0005] Then, this invention offers the tubular and lightweight steering rack shaft which decreases in number the number of processes and brings about a cost fall, and its manufacture method.
[0006]
[Means for Solving the Problem] According to the claim 1, the steering rack shaft concerning this invention is characterized by forming in the periphery side of a shell the concavo-convex field corresponding to the shell inner skin of the tooth back of the rack gear tooth formed in shaft orientations by predetermined length with the aforementioned rack gear tooth.
[0007] According to the claim 2, it is characterized by forming the abutting surface of the both-sides

edge of the Sai chief tabular in the periphery side of this shell that the concavo-convex field corresponding to the shell inner skin of the tooth back of the rack gear tooth formed in shaft orientations by predetermined length is formed in the periphery side of a shell with the aforementioned rack gear tooth, and carries out phase opposite in this concavo-convex field and the diameter direction in the shape of a line.

[0008] According to the claim 3, to the shell inner skin of the tooth back of the rack gear tooth formed in the periphery side of a shell by predetermined length to shaft orientations It is characterized by having formed the abutting surface of the both-sides edge of the Sai chief tabular in the periphery side of this shell that the aforementioned rack gear tooth and a concavo-convex corresponding field are formed, and carries out phase opposite in this concavo-convex field and the diameter direction in the shape of a line, and the abutting surface having joined together by welding.

[0009] Moreover, the manufacture method of the steering rack shaft concerning this invention After according to the claim 4 carrying out bending of the work of the Sai chief tabular to U form, forcing the dies body which fixes this work to the inner mold of reverse U type which has a concavo-convex field corresponding to the radii section with the after-mentioned rack gear tooth, and has the rack tooth form in the radii section by the required pressure and carrying out press forming of the rack gear tooth, It is characterized by carrying out bending of this work to O form (tubular) further.

[0010] After according to the claim 5 carrying out bending of the work of the Sai chief tabular to U form, forcing the dies body which fixes to the inner mold which has a concavo-convex field corresponding to the radii section with the after-mentioned rack gear tooth, and has the rack tooth form in the radii section by the required pressure and carrying out press forming of the rack gear tooth, bending of this work is carried out still more nearly tubular, and it is characterized by finally combining the abutting surface of the both-sides edge of this work by welding.

[0011] And it is characterized by according to the claim 6, the dies-body block which has the rack tooth form being fixed, the radii section of a work countering the aforementioned rack tooth form, and being arranged, rotating, while the inner mold of the shape of a roller which equipped the periphery with the concavo-convex field corresponding to the aforementioned rack tooth form pushes the aforementioned work against a dies-body block, and fabricating a rack gear tooth.

[0012] therefore -- without it forms a rack gear tooth in the peripheral surface of a shell or requires a thick thickening process -- lightweight -- cost -- a cheap steering rack shaft can be acquired

[0013]

[Embodiments of the Invention] The gestalt of implementation of this invention is explained based on drawing below. As shown in drawing 1 (A), the work 1 of the Sai chief tabular is created. The tubular steering rack shaft 2 as shown in drawing 1 (D) from this work 1 is created. The width of face W of a work 1 is the circumferential length of the shell of a diameter required as a steering rack shaft 2, and length L makes it larger than an axial length or it required as a steering rack shaft 2, and it presupposes further that necessary [which can attain lightweight-ization] is thick as for the thickness T. With the gestalt of this operation, since the rack gear tooth 11 is formed with the dies-body block 15 which has the rack tooth form 18, and the inner mold block 16 (refer to drawing 3) which has the concavo-convex field 19, thickness T has the advantage which may be comparatively small, so that a postscript may be carried out.

[0014] Subsequently, as shown in drawing 1 (B), bending of this work 1 is carried out to U form. as this shows drawing 2 , while forming in female mold 3 the semicircle slot 4 which has the radii side which is the half of the circle of the predetermined curvature r -- a punch 5 -- the curvature r of the semicircle slot 4 -- smallness -- the heights 6 which have the radii side which is the half of the circle which has curvature r1 are formed The upper part of heights 6 is perpendicular and forms the flat walls 7 and 7 in both sides. It is fabricated by laying a work 1 in the upper part of the semicircle slot 4 of this female mold 3, and pushing in a work 1 by the predetermined pressure in the semicircle slot 4 by the punch 5. At this time, it lays on female mold 3 so that the center line C of a work 1 may be in agreement with the center line C1 of the semicircle slot 4. Therefore, if a work 1 is pushed in in the semicircle slot 4 by the punch 5, while the semicircle-like radii section 8 will be formed in a work 1 along the semicircle slot 4,

the U form 10 with which the both-sides walls 9 and 9 start upwards from the radii section 8 perpendicularly is formed.
[0015] Next, as shown in drawing 1 (C), the rack gear tooth 11 is formed in the radii section 8 of this U form 10. This arranges the restricted blocks 17 and 17 on the outside of the both-sides walls 9 and 9, respectively, and arranges them possible [rise and fall of the dies-body block 15] in the inside of these restricted blocks 17 and 17 while arranging it so that the inner mold block 16 may be entitled the work 1 used as the U form 10 and the radii section 8 may become a high order with reverse U type as shown in drawing 3 . The rack tooth form 18 is formed in the dies-body block 15, and the concavo-convex fields 19, such as an abbreviation wave cross section corresponding to the rack tooth form 18, are evenly formed in the upper part of the inner mold block 16.
[0016] Then, if press forming of the dies-body block 15 is carried out to the periphery side of the radii section 8 of a work 1 by the necessary pressure, the rack gear tooth 11 will be fabricated by the work 1. In this case, as shown in drawing 6 , an indentation 20 is formed [the U form 10] in the periphery side of the radii section 8 of the rack tooth form 18 and the concavo-convex field 19 at the rack gear tooth 11 and inner skin. Since a work 1 is restrained by the dies-body block 15, the inner mold block 16, and the restricted block 17 at this time, it is processed without the material of a work 1 escaping to others, and each gear tooth of the rack gear tooth 11 is fabricated with thickness almost equal to the thickness T of a work 1. Therefore, a process can be skipped, without [therefore] requiring thickening of thickness T.
[0017] In addition, other examples about fabrication of the rack gear tooth 11 are explained. The dies-body block 15 with which this has the rack tooth form 18 as shown in drawing 7 is being fixed. The radii section 8 which is an outside front face counters the aforementioned rack tooth form 18, and U type object 10 formed like drawing 1 (B) is arranged. While the inner mold 25 of the shape of a roller which equipped the periphery with the concavo-convex field 26 corresponding to the aforementioned rack tooth form 18 pushes this work 1 against the aforementioned dies-body block 15 from the inside front-face side of the aforementioned work 1, it goes in the direction of an illustration a arrow, and it rotates in the direction of b arrow. Thereby, while the rack gear tooth 11 is formed in the periphery side of the radii section 8 of a work 1 of the rack tooth form 18, an indentation 20 is formed in inner skin of the concavo-convex field 26.
[0018] As shown in drawing 1 (D), bending of the work 1 in which the rack gear tooth 11 was formed is carried out to O form (tubular). This by fixing the radii section 8 of the U form 10 to female mold 32, turning the both-sides walls 9 and 9 to female mold 31 by the necessary pressure by the punch 31 using the punch 31 and female mold 32 which have the semicircle slot 30, and pushing by the necessary pressure, as shown in drawing 4 As shown in drawing 5 , the both-sides walls 9 and 9 are compulsorily pushed in in the semicircle slot 30 of a punch 31, and the lightweight and tubular steering rack shaft 2 with which the edge of the both-sides walls 9 and 9 meets in the rack gear tooth 11 and the diameter direction and with which the line-like abutting surface 12 is formed and has the rack gear tooth 11 in respect of a periphery is formed. Therefore, although it can also produce commercially in this stage, since there is a possibility of running short in intensity when it leaves the abutting surface 12 of the shape of an aforementioned line as it is, the abutting surface 12 of the shape of the line is combined by welding, and it considers as a perfect shell.
[0019]
[Effect of the Invention] since a thick rack gear tooth almost equal to the thickness of a work is formed in the radii section of the work which carried out bending to U form with the dies body which has the rack tooth form, and the inner mold which has the concavo-convex field which fits loosely into the rack tooth form according to this invention explained above, without having the thickening process of a work -- a tubular and lightweight steering rack shaft -- cost -- it can manufacture cheaply

---

[Translation done.]

* NOTICES *

1. This document has been translated by computer.So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, there are some problems in forming a rack gear tooth in the periphery side of a shell. That is, if it is going to carry out press forming by the dies body which has a rack gear-tooth type for a rack gear tooth in the periphery side of a shell, there is a limit in the inner mold which must insert an inner mold into a shell and can be inserted into **** and a shell, and since it needs to be able to draw out after fabrication, there cannot be no inner mold effective besides inserting the solid round bar like the aforementioned conventional example. Therefore, in only forming a rack gear tooth in the thick section of a shell, since the thickness of the part in which the rack gear tooth was formed becomes thin, a strong fall is brought about. Therefore, when a thick big shell is used, as a result of being contradictory in lightweight-ization, a part of periphery section of the shell of necessary thickness is made to transform, and it thickens, and supposes that a rack gear tooth is formed in the thickening section, and for the reason, the number of processes increases and a cost rise is invited. [0005] Then, this invention offers the tubular and lightweight steering rack shaft which decreases in number the number of processes and brings about a cost fall, and its manufacture method.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

MEANS

[Means for Solving the Problem] According to the claim 1, the steering rack shaft concerning this invention is characterized by forming in the periphery side of a shell the concavo-convex field corresponding to the shell inner skin of the tooth back of the rack gear tooth formed in shaft orientations by predetermined length with the aforementioned rack gear tooth.
[0007] According to the claim 2, it is characterized by forming the abutting surface of the both-sides edge of a ** length tabular in the periphery side of this shell that the concavo-convex field corresponding to the shell inner skin of the tooth back of the rack gear tooth formed in shaft orientations by predetermined length is formed in the periphery side of a shell with the aforementioned rack gear tooth, and carries out phase opposite in this concavo-convex field and the diameter direction in the shape of a line.
[0008] According to the claim 3, to the shell inner skin of the tooth back of the rack gear tooth formed in the periphery side of a shell by predetermined length to shaft orientations It is characterized by having formed the abutting surface of the both-sides edge of a ** length tabular in the periphery side of this shell that the aforementioned rack gear tooth and a concavo-convex corresponding field are formed, and carries out phase opposite in this concavo-convex field and the diameter direction in the shape of a line, and the abutting surface having joined together by welding.
[0009] Moreover, the manufacture method of the steering rack shaft concerning this invention After according to the claim 4 carrying out bending of the work of a ** length tabular to U form, forcing the dies body which fixes this work to the inner mold of reverse U type which has a concavo-convex field corresponding to the radii section with the after-mentioned rack gear tooth, and has the rack tooth form in the radii section by the required pressure and carrying out press forming of the rack gear tooth, It is characterized by carrying out bending of this work to O form (tubular) further.
[0010] After according to the claim 5 carrying out bending of the work of a ** length tabular to U form, forcing the dies body which fixes to the inner mold which has a concavo-convex field corresponding to the radii section with the after-mentioned rack gear tooth, and has the rack tooth form in the radii section by the required pressure and carrying out press forming of the rack gear tooth, bending of this work is carried out still more nearly tubular, and it is characterized by finally combining the abutting surface of the both-sides edge of this work by welding.
[0011] And it is characterized by according to the claim 6, the dies-body block which has the rack tooth form being fixed, the radii section of a work countering the aforementioned rack tooth form, and being arranged, rotating, while the inner mold of the shape of a roller which equipped the periphery with the concavo-convex field corresponding to the aforementioned rack tooth form pushes the aforementioned work against a dies-body block, and fabricating a rack gear tooth.
[0012] therefore -- without it forms a rack gear tooth in the peripheral surface of a shell or requires a thick thickening process -- lightweight -- cost -- a cheap steering rack shaft can be acquired
[0013]
[Embodiments of the Invention] The gestalt of implementation of this invention is explained based on drawing below. As shown in drawing 1 (A), the work 1 of a ** length tabular is created. The tubular

steering rack shaft 2 as shown in drawing 1 (D) from this work 1 is created. The width of face W of a work 1 is the circumferential length of the shell of a diameter required as a steering rack shaft 2, and length L makes it larger than an axial length or it required as a steering rack shaft 2, and it presupposes further that necessary [which can attain lightweight-ization] is thick as for the thickness T. With the gestalt of this operation, since the rack gear tooth 11 is formed with the dies-body block 15 which has the rack tooth form 18, and the inner mold block 16 (refer to drawing 3) which has the concavo-convex field 19, thickness T has the advantage which may be comparatively small, so that a postscript may be carried out.

[0014] Subsequently, as shown in drawing 1 (B), bending of this work 1 is carried out to U form. as this shows drawing 2 , while forming in female mold 3 the semicircle slot 4 which has the radii side which is the half of the circle of the predetermined curvature r -- a punch 5 -- the curvature r of the semicircle slot 4 -- smallness -- the heights 6 which have the radii side which is the half of the circle which has curvature r1 are formed The upper part of heights 6 is perpendicular and forms the flat walls 7 and 7 in both sides. It is fabricated by laying a work 1 in the upper part of the semicircle slot 4 of this female mold 3, and pushing in a work 1 by the predetermined pressure in the semicircle slot 4 by the punch 5. At this time, it lays on female mold 3 so that the center line C of a work 1 may be in agreement with the center line C1 of the semicircle slot 4. Therefore, if a work 1 is pushed in in the semicircle slot 4 by the punch 5, while the semicircle-like radii section 8 will be formed in a work 1 along the semicircle slot 4, the U form 10 with which the both-sides walls 9 and 9 start upwards from the radii section 8 perpendicularly is formed.

[0015] Next, as shown in drawing 1 (C), the rack gear tooth 11 is formed in the radii section 8 of this U form 10. This arranges the restricted blocks 17 and 17 on the outside of the both-sides walls 9 and 9, respectively, and arranges them possible [rise and fall of the dies-body block 15] in the inside of these restricted blocks 17 and 17 while arranging it so that the inner mold block 16 may be entitled the work 1 used as the U form 10 and the radii section 8 may become a high order with reverse U type as shown in drawing 3 . The rack tooth form 18 is formed in the dies-body block 15, and the concavo-convex fields 19, such as an abbreviation wave cross section corresponding to the rack tooth form 18, are evenly formed in the upper part of the inner mold block 16.

[0016] Then, if press forming of the dies-body block 15 is carried out to the periphery side of the radii section 8 of a work 1 by the necessary pressure, the rack gear tooth 11 will be fabricated by the work 1. In this case, as shown in drawing 6 , an indentation 20 is formed [the U form 10] in the periphery side of the radii section 8 of rack gear-tooth type 18 and the concavo-convex field 19 at the rack gear tooth 11 and inner skin. Since a work 1 is restrained by the dies-body block 15, the inner mold block 16, and the restricted block 17 at this time, it is processed without the material of a work 1 escaping to others, and each gear tooth of the rack gear tooth 11 is fabricated with thickness almost equal to the thickness T of a work 1. Therefore, a process can be skipped, without [therefore] requiring thickening of thickness T.

[0017] In addition, other examples about fabrication of the rack gear tooth 11 are explained. The dies-body block 15 with which this has the rack tooth form 18 as shown in drawing 7 is being fixed. The radii section 8 which is an outside front face counters the aforementioned rack tooth form 18, and U type object 10 formed like drawing 1 (B) is arranged. While the inner mold 25 of the shape of a roller which equipped the periphery with the concavo-convex field 26 corresponding to the aforementioned rack tooth form 18 pushes this work 1 against the aforementioned dies-body block 15 from the inside front-face side of the aforementioned work 1, it goes in the direction of an illustration a arrow, and it rotates in the direction of b arrow. Thereby, while the rack gear tooth 11 is formed in the periphery side of the radii section 8 of a work 1 of the rack tooth form 18, an indentation 20 is formed in inner skin of the concavo-convex field 26.

[0018] As shown in drawing 1 (D), bending of the work 1 in which the rack gear tooth 11 was formed is carried out to O form (tubular). This by fixing the radii section 8 of the U form 10 to female mold 32, turning the both-sides walls 9 and 9 to female mold 31 by the necessary pressure by the punch 31 using the punch 31 and female mold 32 which have the semicircle slot 30, and pushing by the necessary

pressure, as shown in drawing 4 As shown in drawing 5 , the both-sides walls 9 and 9 are compulsorily pushed in in the semicircle slot 30 of a punch 31, and the lightweight and tubular steering rack shaft 2 with which the edge of the both-sides walls 9 and 9 meets in the rack gear tooth 11 and the diameter direction and with which the line-like abutting surface 12 is formed and has the rack gear tooth 11 in respect of a periphery is formed. Therefore, although it can also produce commercially in this stage, since there is a possibility of running short in intensity when it leaves the abutting surface 12 of the shape of an aforementioned line as it is, the abutting surface 12 of the shape of the line is combined by welding, and it considers as a perfect shell.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The process ****** type view showing the gestalt of implementation of this invention
[Drawing 2] The cross section of the bending process of U form
[Drawing 3] The cross section of the forming cycle of a rack gear tooth
[Drawing 4] It is the cross section of a process in the bending first half of O form.
[Drawing 5] It is the cross section of a process in the bending second half of O form.
[Drawing 6] The expanded sectional view of the forming cycle of a rack gear tooth
[Drawing 7] The expanded sectional view showing other examples of the forming cycle of a rack gear tooth
[Description of Notations]
1 -- Work
2 -- Steering rack shaft
3 32 -- Female mold
4 30 -- Semicircle slot
5 31 -- Punch
8 -- Radii section
10 -- U form
11 -- Rack gear tooth
12 -- Abutting surface
15 -- Dies-body block
16 -- Inside type block
17 -- Restricted block
18 -- Rack tooth form
19 -- Concavo-convex side
20 -- Indentation
25 -- Roller-like inner mold
26 -- Concavo-convex side

[Translation done.]

* NOTICES *

1. This document has been translated by computer.So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] The steering rack shaft characterized by forming in the periphery side of a shell the concavo-convex field corresponding to the shell inner skin of the tooth back of the rack gear tooth formed in shaft orientations by predetermined length with the aforementioned rack gear tooth.
[Claim 2] The steering rack shaft characterized by forming the abutting surface of the both-sides edge of a ** length tabular in the periphery side of this shell that the concavo-convex field corresponding to the shell inner skin of the tooth back of the rack gear tooth formed in shaft orientations by predetermined length is formed in the periphery side of a shell with the aforementioned rack gear tooth, and carries out phase opposite in this concavo-convex field and the diameter direction in the shape of a line.
[Claim 3] To the shell inner skin of the tooth back of the rack gear tooth formed in the periphery side of a shell by predetermined length to shaft orientations The steering rack shaft characterized by having formed the abutting surface of the both-sides edge of a ** length tabular in the periphery side of this shell that the aforementioned rack gear tooth and a concavo-convex corresponding field are formed, and carries out phase opposite in this concavo-convex field and the diameter direction in the shape of a line, and the abutting surface having joined together by welding.
[Claim 4] The manufacture method of the steering rack shaft which carries out bending of this work still more nearly tubular, and is characterized by the bird clapper after carrying out bending of the work of a **** tabular to U form, forcing the dies body which fixes this work to the inner mold of reverse U type which has a concavo-convex field corresponding to the radii section with the after-mentioned rack gear tooth, and has the rack tooth form in the radii section by the required pressure and carrying out press forming of the rack gear tooth.
[Claim 5] The manufacture method of the steering rack shaft which carries out bending of this work still more nearly tubular, and is characterized by finally combining the abutting surface of the both-sides edge of this work by welding after carrying out bending of the work of a **** tabular to U form, forcing the dies body which fixes to the inner mold which has a concavo-convex field corresponding to the radii section with the after-mentioned rack gear tooth, and has a rack gear-tooth type in the radii section by the required pressure and carrying out press forming of the rack gear tooth.
[Claim 6] The manufacture method of the steering shaft according to claim 1, 2, or 3 characterized by the dies-body block which has a rack gear-tooth type being fixed, the radii section of a work countering a described [above] rack gear-tooth type, and being arranged, rotating while the inner mold of the shape of a roller which equipped the periphery with the concavo-convex field corresponding to a described [above] rack gear-tooth type pushes the aforementioned work against a dies-body block, and fabricating a rack gear tooth.

[Translation done.]

* NOTICES *

1. This document has been translated by computer.So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

PRIOR ART

[Description of the Prior Art] Recently, as much as possible lightweight-ization of autoparts is demanded for the purpose of the improvement in mpg of an automobile. As part of that, newly forming a rack gear tooth in the periphery side using a hollow pipe came (for example, refer to JP,4-173476,A, JP,4-173477,A, JP,6-182472,A, and JP,6-31350,A) to be performed from the rack shaft in a steering system also broaching the conventional solid rod, and forming a rack gear tooth.
[0003] Each manufacture method of these steering rack shafts is characterized by forming the rack gear tooth of predetermined length in the periphery side of a shell to shaft orientations. For this rack gear tooth, a pinion gears within a steering gearbox, and a gearbox is connected to a steering column through an intermediate shaft. Therefore, if rotation operation of the wheel of a steering is carried out, a pinion rotates within a steering gearbox, a rack will move, a steering rack shaft will be moved to one of right and left, a front wheel will be steered by this, and steering of an automobile will be attained.

[Translation done.]

* NOTICES *

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

EFFECT OF THE INVENTION

[Effect of the Invention] since a thick rack gear tooth almost equal to the thickness of a work is formed in the radii section of the work which carried out bending to U form with the dies body which has a rack gear-tooth type, and the inner mold which has the concavo-convex field which fits loosely into the rack gear-tooth type according to this invention explained above, without having the thickening process of a work -- a tubular and lightweight steering rack shaft -- cost -- it can manufacture cheaply

[Translation done.]